INTEGRATED SAFETY AND HEALTH MANAGEMENT FRAMEWORK (ISHMF) FOR FACILITY DEACTIVATION AND DECOMMISSIONING

INTRODUCTION

The purpose of this paper is to describe an Integrated Safety and Health Management Framework (ISHMF) that was developed for the Department of Energy's deactivation and decommissioning (D&D) activities. Since 1993, the EH-5 D&D Technical Assistance Project has developed and demonstrated the ISHMF at the Hanford PUREX deactivation project. The ISHMF and lessons learned from PUREX were documented in DOE/EH-0486, *Integrated Safety and Health During Deactivation With Lessons Learned From PUREX*, September 29, 1995. EH-5 is currently assisting other D&D projects in formulating and implementing their facility-specific ISHMF. To promote consistent application of the ISHMF across the complex, a Departmental D&D Standard is currently being developed. This guidance will also clarify the applicability of existing safety and health requirements for D&D and establish safety and health performance expectations to support contract reform and safety and health review of D&D activities.

The goal of the ISHMF is to link together safety and health programs and activities that have traditionally been performed independently of one another. The integrated approach incorporates the elements of proven DOE and external DOE safety and health programs as illustrated in Table 1. These include DOE's programs on Enhanced Work Planning (EWP), Nuclear Safety, Fire Protection, Radiation Protection, Work Smart and Voluntary Protection (VPP). External safety and health programs and regulations include OSHA's Process Safety Management (PSM) and Hazardous Waste Operations and Emergency Response (HAZWOPER), and the Chemical Manufacturers' Association Responsible Care Program.

ISHMF OBJECTIVES

The ISHMF objectives are to help: (1) reduce accidents, injuries or hazard exposure; (2) improve project and work efficiency; and (3) increase project cost savings or avoidance. The ISHMF has the following safety principles:

- Graded approach to identification, analysis and control for all hazards.
- Integration of nuclear safety basis establishment and occupational safety determination to minimize duplicative efforts.
- Involvement of safety and health professionals early in work planning and engineering, and continued involvement throughout the actual work.
- Increased worker involvement in the work planning and hazards characterization process through a team approach.

These principles are consistent with those of Defense Nuclear Facilities Safety Board Recommendation (DNFSB) 95-2 and the DOE's DNFSB 95-2 Implementation Plan. A comparison was documented in a report, *Comparison of EH D&D Technical Assistance Project with DNFSB Recommendation 95-2 Implementation Plan*, May 2, 1996.

ISHMF OVERVIEW

The ISHMF is a systematic safety management system that evaluates all hazards

and identifies the best and most cost-effective hazard controls required to protect both the worker and the public. It is applied for the entire project and during the individual work tasks. The ISHMF applies the concept of graded hazard analysis by encouraging the use of hazard analysis techniques that are commensurate with the difficulty of the work, the types and severity of hazards, and the working experience of the D&D team.

The ISHMF is implemented by following a two-tiered proces illustrated in Figure 1. The first tier addresses the integration of safety and health as well as safety and health documentation at the overall facility level. Elements of the first tier include the formation of the multi-disciplinary project team, preliminary hazards analysis, identification of the applicable requirements and standards for the project, and preparation of facility level safety and health documents.

The second tier addresses the integration of safety and health activities into work packages, instructions or plans. For individual work tasks, a hazards screening process is used to evaluate each job based on three criteria:

1) potential risk to the worker and public;
2) worker experience in and training for conducting similar jobs; and 3) job complexity. Evaluation based on these criteria will determine the graded hazard analysis.

The graded hazards analysis process is conducted using a team approach that includes workers applying a hazards check list approach, to determine "what if" scenarios that must be analyzed, or more formal approaches such as a hazards and operability (HAZOP) analysis. Additionally, this process is integrated with the requirements established by the DOE nuclear safety framework, including the Unreviewed Safety Question (USQ) process and the Operational Readiness Review (ORR) program.

The safety and health documents from the application of the ISHMF are shown in Figure 2. At the facility level, these documents form the facility authorization bases. These bases include safety, standards, and work commitment. Examples of safety and health documents include: Safety Analysis Report (SAR), Basis for Interim Operations (BIO) or Auditible Safety Analysis (ASA); Health and Safety Plan (HASP); and Technical Safety Requirements (TSR); Standards/Requirements Identification Documents (S/RID) or the Necessary and Sufficient (N&S) set of standards; and D&D Project Plan.

At the job task level, the authorization bases are carried down to individual work packages. A work package includes: a set of standards and corresponding work procedures selected to control the job; work permits (e.g., radiation work, confined space); job hazard analysis to ensure worker protection; and change control (e.g., USQ) process documentation to ensure that the work and hazards are within the safety envelope/authorization bases of the facility. Documentation for the job execution include readiness assessment (or ORR, if necessary), corrective actions and closure package.

BENEFITS

The application of the ISHMF would provide the following benefits.

- better safety and health performance through multi-disciplined project teams and direct participation in hazard identification, analysis and control;
- increased efficiency in the work development and execution process;
- improved communications throughout the facility organizations that are involved in teaming from the time when planning for D&D begins until the work is actually

completed; and

- improved project cost performance through application of a graded approach to hazard analysis, identification, screening and control at all levels of project planning and execution.

LESSONS LEARNED

The implementation of the ISHMF has resulted in improved worker safety and cost savings at the Hanford PUREX Deactivation Project. These savings are based on the decrease in the lost work day occurrences (resulting from a number of factors of which the ISHMF is one) and the reduction of the necessary safety documentation related to the authorization basis. The total of these savings has been estimated at over $800,000 in two years.

Additional results include successfully increasing worker involvement in the work development and in the hazards identification and control processes. Overall, the ISHMF provided more systematic and thorough evaluations of potential hazards associated with the proposed D&D work activities and better USQ determinations based on these evaluations. The ISHMF is being incorporated into the Hanford deactivation re-engineering effort.

The ISHMF concept has been successfully applied at sites such as the Idaho National Engineering Laboratory and the Oak Ridge National Laboratory's K-25 Powerhouse Demolition Project. At Idaho, a D&D workforce of sixty people applying ISHMF-like concepts to several small-scale D&D projects had an three-year average lost/restricted workday rate of 6.9 compared to the site's average of 31.9. Complex-wide, this average is 44.5 days. In addition, Idaho reports that these small- scale D&D projects are 35% ahead of schedule and 6% under budget.

At the K-25 site, application of ISHMF-like concepts has resulted in over 49,000 hours of work by a demolition contractor on the Powerhouse Demolition Project without a single, recordable safety incident. Site managers have reported that the project was completed six months ahead of schedule, and six millions dollars below budget with ten percent more work accomplished than initially planned.

Table 1

Safety and Health Protection Attributes Incorporated in the D&D Integrated Safety and Health Management Framework (ISHMF)

(Current ISHMF Does Not Address Environmental Protection, Which Will Be Added In the Future)

D&D ISHMF =		DOE Nuclear Safety	+ OSHA PSM	+ OSHA HAZ-WOPER	+ DOE VPP	+ DOE Fire Protec-tion	+ CMA Respon-sible Care	+ DOE N&S	+ DOE Rad Con	+ DOE EWP
SCOPE:										
Public Safety and Health Protection	X	X				X	X	X		
Worker Safety and Health Protection	X	X	X	X	X	X	X	X	X	X
Integration of Public and Worker Protection	X					X				
SAFETY AND HEALTH ATTRIBUTES FOR PROJECT PLANNING, JOB PLANNING, JOB EXECUTION AND FEEDBACK:										
Know the Work and Hazards	X	X	X	X	X	X	X	X	X	X
Early S&H Involvement	X	X	X	X	X	X	X	X	X	X
Multi-Disciplinary Team Approach	X					X		X		X
Worker Involvement	X		X	X	X	X	X	X	X	X
Hazard Identification, Analysis and Control										
Project/Facility Level	X	X	X	X	X	X	X	X	X	X
Job Task Level	X			X	X	X	X	X	X	X
Hazard Types: Nuclear (Public)	X	X						X		
Nuclear (Worker)	X	X		X			X	X	X	X
Chemical (Public)	X						X	X		
Chemical (Worker)	X		X	X	X		X	X		X
Industrial	X			X	X		X	X		X

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Fire	X	X				X		X		
Biological	X			X	X		X	X		X
Integrated Hazard Identification and Analysis	X					X	X	X		X
Graded Job Task Hazard Analysis	X					X	X	X	X	X
Facility Hazard Categorization (DOE 5480.23, STD 1027)	X	X								
Accident Analysis (Quantitative)	X	X								
S/RID or N&S Set of S&H Requirements	X	X				X		X		
Engineering and Technology Selection	X	X	X	X		X	X		X	
Work Commitments (i.e., Project Plan, Deactivation Plan, Decommissioning Plan)	X			X	X	X		X	X	
Work Commitments (Work Control System, Work Package)	X			X		X		X	X	X
Risk-Based Job Task Planning and Prioritization (Urgent Risk Reduction; Budget and Resource Allocation)	X									
Performance Expectations (Contract Reform)	X									
Performance Measures	X				X	X	X		X	
S&H End-State Criteria	X					X				
Authorization Basis Agreement (DNFSB 95-2)	X									
Authorization Basis Verification (USQ)	X	X								
Training	X	X	X	X	X	X	X	X	X	X

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Readiness Review	X	X	X	X	X	X	X		X	
Pre-Job Briefing	X		X	X	X	X	X		X	X
Performance Monitoring	X		X	X	X	X	X		X	X
Feedback and Improvement	X		X	X	X	X	X		X	X